WHAT IS CLAIMED IS:

1. A calibration method in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the method comprising the steps of:

providing a reference mark on the base frame to reside in the visual field of the component recognizing camera;

positioning the movable table to a predetermined position relative to a coordinate origin to make the reference mark come in the visual field of the board recognizing camera; and

calculating a positional relation between optical axes of the board recognizing camera and the component recognizing camera when the movable table is positioned at the predetermined position, based on respective positional relations of the reference mark relative to the optical axes of the component recognizing camera and the board recognizing camera, the respective positional relations being detected by the component recognizing camera and the board recognizing camera.

2. A calibration method in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on

the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the method comprising the steps of:

providing a reference mark on the base frame to reside in the visual field of the component recognizing camera;

positioning the movable table to make the reference mark come in the visual filed of the board recognizing camera and at the same time, to make the end of a component pick-up portion of the component placing device come in the visual field of the component recognizing camera; and

calculating a positional relation between the board recognizing camera and a center line of the component pick-up portion based on the following positional relations (1) and (2):

(1) a positional relation between an optical axis of the board recognizing camera and the reference mark which relation is detected by the board recognizing camera, and

(2) positional relations of the reference mark and the center line of the component pick-up portion relative to an optical axis of the component recognizing camera which relations are detected by the component recognizing camera.

3. A calibration method in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the method comprising the steps of:

providing the base frame with first and second reference marks of a

predetermined positional relation with the first reference mark residing in the visual field of the component recognizing camera;

positioning the movable table to make the second reference mark come in the visual filed of the board recognizing camera and at the same time, to make the end of a component pick-up portion of the component placing device come in the visual field of the component recognizing camera; and

calculating a positional relation between the optical axis of the board recognizing camera and a center line of the component pick-up portion based on the following positional relations (1)-(3):

(1) a positional relation between the optical axis of the board recognizing camera and the second reference mark which relation is detected by the board recognizing camera,

(2) positional relations of the first reference mark and the center line of the component pick-up portion relative to an optical axis of the component recognizing camera which relations are detected by the component recognizing camera, and

(3) the positional relation between the first and second reference marks.

4. A calibration method in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the method comprising:

a first step of providing a reference mark on the base frame to reside in the visual field of the component recognizing camera;

a second step of positioning the movable table to a first position to make the

reference mark come in the visual field of the board recognizing camera and detecting respective positional relations of the reference mark relative to optical axes of the component recognizing camera and the board recognizing camera by the use of these cameras;

a third step of positioning the movable table to a second position to make the end of a component pick-up portion of the component placing device come in the visual field of the component recognizing camera and detecting a positional relation between the optical axis of the component recognizing camera and a center line of the component pick-up portion by the use of the component recognizing camera, one of the second and third steps being performed prior to the other; and

calculating a positional relation between the optical axis of the board recognizing camera and the center line of the component pick-up portion based on the following positional relations (1)-(3):

(1) the positional relation between the axes of the board recognizing camera and the component recognizing camera detected with the movable table being positioned at the first position;

(2) the positional relation between the optical axis of the component recognizing camera and the center line of the component pick-up portion detected with the movable table being positioned at the second position; and

(3) a positional relation between the first and second positions.

5. A calibration method in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device detachably installed on the movable table and provided with a rotary head capable of rotationally indexing plural spindles for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base

frame; the method comprising the steps of:

taking the image of a reference mark provided on the base frame by the component recognizing camera;

taking the image of the reference mark or another reference mark of a predetermined positional relation thereto by the board recognizing camera with the movable table being stopped at a predetermined position relative to a coordinate origin;

calibrating the coordinate position of an optical axis of the component recognizing camera relative to the coordinate origin based on respective positional relations between the optical axes of the component recognizing camera and the board recognizing camera and the reference mark which relations are detected by these cameras;

moving the movable table to a predetermined potion to position the rotational center of the rotary head at the calibrated coordinate position of the optical axis of the component recognizing camera;

taking the end images of suction nozzles attached to all the spindles;

obtaining rotational centers of the all the spindles based on the end images of the suction nozzles; and

obtaining as a compensating value an error in installing the rotary head on the movable table based on a rotational center position of the rotary head obtained from the rotational centers of the all the spindles and based on the coordinate position of the optical axis of the component recognizing camera.

6. The calibration method as set for in Claim 5, further comprising the steps of:

taking the end images of the suction nozzles by the component recognizing camera with the all the spindles being positioned at a first rotational angular position;

taking the end images of the suction nozzles by the component recognizing camera with the all the spindles being positioned at a second rotational angular position which is rotated 180 degrees from the first rotational angular position;

obtaining, as rotational center positions of the spindles, rotational center positions of the suction nozzles by making the arithmetic average of center positions obtained from the end images of the suction nozzles at the first rotational angular position and center positions obtained from the end images of the suction nozzles at the second rotational angular position; and

obtaining the rotational center of the rotary head from the rotational center positions of the spindles.

7. The calibration method as set for in Claim 5, further comprising the steps of:

taking, by the component recognizing camera, the end image of the suction nozzle of each spindle indexed to a mounting point when the spindle is at a lifted position;

taking, by the component recognizing camera, the end image of the suction nozzle of each spindle indexed to the mounting point when the spindle is at a lowered position; and

obtaining, as a compensating value, a lowering error of each spindle based on positions of the end images of each spindle at the lifted position and the lowered position.

8. The calibration method as set for in Claim 5, further comprising the steps of:

moving the movable table to a predetermined position that the rotational center of the rotary head is positioned to the calibrated coordinate position of the optical axis of the component recognizing camera, with the suction nozzle of each spindle holding a component;

taking the image of each component held on the end of each suction nozzle by the component recognizing camera; and

obtaining as a compensating value a holding error of each component relative to the rotational center of each spindle based on the image of each component.

9. A calibration method in an electronic component mounting apparatus

having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device detachably installed on the movable table and provided with a rotary head capable of rotationally indexing plural spindles for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; the method comprising the steps of:

taking the image of a reference mark provided on the base frame by the component recognizing camera;

taking the image of the reference mark or another reference mark of a predetermined positional relation thereto by the board recognizing camera with the movable table being stopped at a predetermined position relative to a coordinate origin;

calibrating the coordinate position of an optical axis of the component recognizing camera relative to the coordinate origin based on respective positional relations between the optical axes of the component recognizing camera and the board recognizing camera and the reference mark which relations are detected by these cameras;

moving the movable table to a predetermined position so that the rotational center of the spindle indexed to the mounting point is positioned to the calibrated coordinate position of the optical axis of the component recognizing camera;

taking the end image of the suction nozzle attached to each spindle by the component recognizing camera with each spindle being positioned at a first rotational angular position;

taking the end image of the suction nozzle attached to each spindle by the component recognizing camera with each spindle being positioned at a second rotational angular position which is rotated through 180 degrees from the first

rotational angular position;

obtaining a rotational center position of each spindle by making the arithmetic average of center positions of end images of each suction nozzle indexed to the mounting point which images are taken respectively when each suction nozzle is rotated to the first and second rotational angular positions; and

obtaining a compensating value for the rotational center position of each spindle based on the rotational center position at the mounting point obtained from the end images and a designed rotational center position of each spindle.

10. A calibration device in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the calibration device including:

a reference mark provided on the base frame to come in the visual fields of the component recognizing camera and the board recognizing camera when the movable table is positioned at a predetermined position relative to a coordinate origin of the electronic component mounting apparatus; and

calculation means for calculating a positional relation between optical axes of the board recognizing camera and the component recognizing camera when the movable table is positioned at the predetermined position, based on respective positional relations of the reference mark relative to the optical axes of the component recognizing camera and the board recognizing camera, the respective positional relations being detected by the component recognizing camera and the board recognizing camera.

11. A calibration device in an electronic component mounting apparatus having a circuit board transfer device mounted on a base frame for performing the loading, unloading and positioning of circuit boards; a movable table supported on the base frame to be movable in two directions of X and Y directions; a component placing device installed on the movable table for taking out components supplied by a component supply device and mounting the components on the circuit board positioned on the circuit board transfer device; a board recognizing camera fixed on the movable table; and a component recognizing camera fixed on the base frame; wherein the component placing device is replaceable with another component placing device different in performance, the calibration device including:

first and second reference marks provided on the base frame in a predetermined positional relation so that when the movable table is positioned to a predetermined position to make the end of a component pick-up portion of the component placing device come in the visual field of the component recognizing camera, the first reference mark comes in the visual field of the component recognizing camera, while the second reference mark comes in the visual field of the board recognizing camera; and

calculation means for calculating a positional relation between the optical axis of the board recognizing camera and a center line of the component pick-up portion based on the following positional relations (1)-(3):

(1) a positional relation between the optical axis of the board recognizing camera and the second reference mark which relation is detected by the board recognizing camera,

(2) positional relations of the first reference mark and the center line of the component pick-up portion relative to an optical axis of the component recognizing camera which relations are detected by the component recognizing camera, and

(3) the positional relation between the first and second reference marks.

12. The calibration device as set forth in Claim 11, wherein the first and second reference marks are provided on a reference gauge, and wherein the

reference gauge is detachably set on a support member secured to the base frame.